PRICE $2.00

HEATH COMPANY, BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT® by DAYSTROM

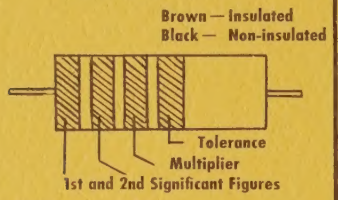
HAND-HELD CITIZENS' BAND TRANSCEIVER

MODEL GW-30

STANDARD COLOR CODE — RESISTORS AND CAPACITORS

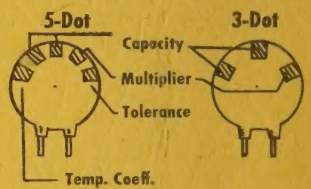
INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier
BLACK	0	0	None
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	,000
YELLOW	4	4	0,000
GREEN	5	5	00,000
BLUE	6	6	000,000
VIOLET	7	7	0,000,000
GRAY	8	8	00,000,000
WHITE	9	9	000,000,000

AXIAL LEAD RESISTOR

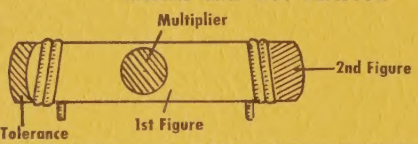


Wire wound resistors have 1st digit band double width

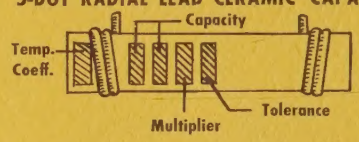
DISC CERAMIC RMA CODE



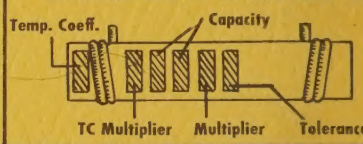
RADIAL LEAD DOT RESISTOR



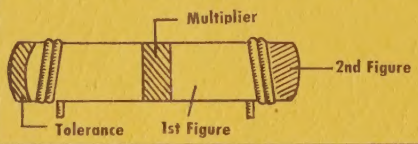
5-DOT RADIAL LEAD CERAMIC CAPACITOR



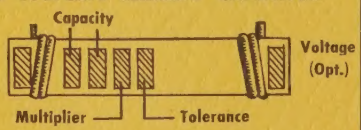
EXTENDED RANGE TC CERAMIC HICAP



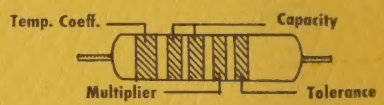
RADIAL LEAD (BAND) RESISTOR



BY-PASS COUPLING CERAMIC CAPACITOR



AXIAL LEAD CERAMIC CAPACITOR

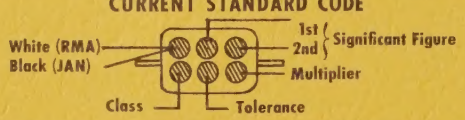


The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heathkits are ½ watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors ½ watt, 1 or 2 watt may be color coded but the first band will be double width.

MOLDED MICA TYPE CAPACITORS

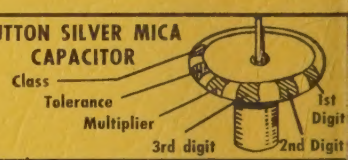
CURRENT STANDARD CODE



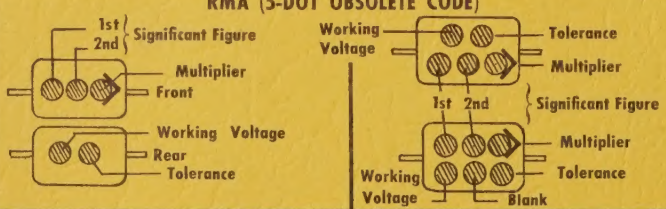
JAN & 1948 RMA CODE

RMA 3-DOT (OBSOLETE) RATED 500 W.V.D.C. ± 20% TOL.

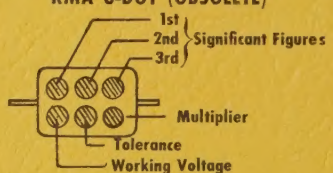
BUTTON SILVER MICA CAPACITOR



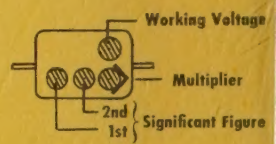
RMA (5-DOT OBSOLETE CODE)



RMA 6-DOT (OBSOLETE)

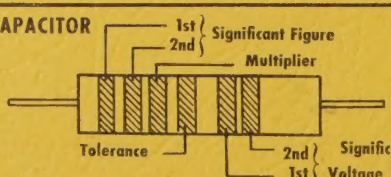


RMA 4-DOT (OBSOLETE)



MOLDED PAPER TYPE CAPACITORS

TUBULAR CAPACITOR

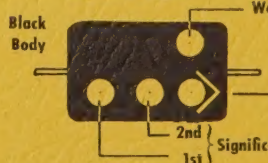


Normally stamped for value

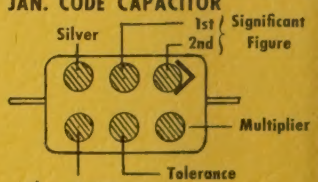
A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.

MOLDED FLAT CAPACITOR

Commercial Code



JAN. CODE CAPACITOR



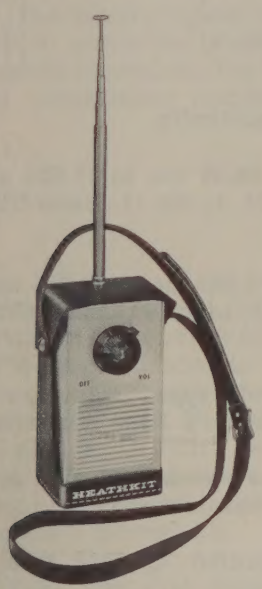
The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

Courtesy of Centralab

Assembly and Operation of the HEATHKIT® HAND-HELD CITIZEN'S BAND TRANSCEIVER

MODEL GW-30



HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

a subsidiary of DAYSTROM, INCORPORATED

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All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

11/25/60

SPECIFICATIONS

Receiver Section

Receiver Type:	Superregenerative detector.
Sensitivity:	Usable with signals as low as 4 microvolts at the antenna terminal.
Tuning Range:	Fixed (by internal adjustment) at any Channel, 1 through 23, in the 11-Meter Citizen's Band (26.965 mc to 27.255 mc).
Audio Power Output:	Approximately 30 milliwatts.
Speaker:	3.2 Ω, round. This speaker is used as a microphone when transmitting.
Control:	Combination OFF-ON switch and volume control on front of cabinet.

Transmitter Section

RF Input Power:	Approximately 90 milliwatts.
** Frequency, unlicensed:	Crystal controlled 26.97 mc to 27.255 mc (any channel, 2 through 23, in the 11-Meter Citizen's Band).
** Frequency, licensed:	Crystal controlled 26.965 mc to 27.255 mc (any channel, 1 through 23, in the 11-Meter Citizen's Band).
Crystal:	Subminiature, plug-in type. Tolerance .005% (meets Class D Citizen's Band requirements).
Microphone:	3.2 Ω speaker. This speaker is also used for audio reproduction when receiving.
Modulation:	High level AM, limited to less than 100%.
* Antenna:	40" whip type, collapsible to 6".
Control:	Single push-to-transmit switch on side of cabinet.

Power Supply

* Battery:	9 volt battery - Types: Burgess #2N6 Eveready #246 Mallory #M1602 NEDA #1602 Ray-O-Vac #1602

Battery Life:.	Approximately 75 hours (normal intermittent use).
Total Receiver Current Drain:.	Approximately 12 milliamperes.
Total Transmitter Current Drain:.	Approximately 22 milliamperes.

General

Transistors:.	1 - 2N1108 (Receiver) 1 - R424 (Transmitter) 2 - 2N185 (Audio)
Cabinet Dimensions:.	6-1/2" high x 3-1/4" wide x 2-3/8" deep.
Net Weight:.	2 lbs.
Shipping Weight:.	3 lbs.

* The antenna supplied and the specified battery must be used to assure compliance with FCC Rules and Regulations, Parts 15 and 19.

** Specify desired channel when ordering additional crystals. See the Crystal List on Page 28.

NOTE: The tuned circuits of the GW-30 can be adjusted to cover the 10-Meter band for licensed amateur operation. For 10-Meter operation, use an appropriate miniature 3rd overtone crystal (type ML18 with wire leads). The 10-Meter crystals are not available from Heath Co. Adjust the transmitter and receiver sections to the 10-Meter frequency you plan to use.

INTRODUCTION

The HEATHKIT® Model GW-30 Transceiver is a combination transmitter and receiver designed for voice communication in the 11-Meter Band. A license is not required to operate the GW-30 in accordance with Federal Communications Commission (FCC) Rules and Regulations, Part 15, over the frequency range of 26.97 mc to 27.27 mc. Unlicensed operation is allowed only on Channels 2 through 23.

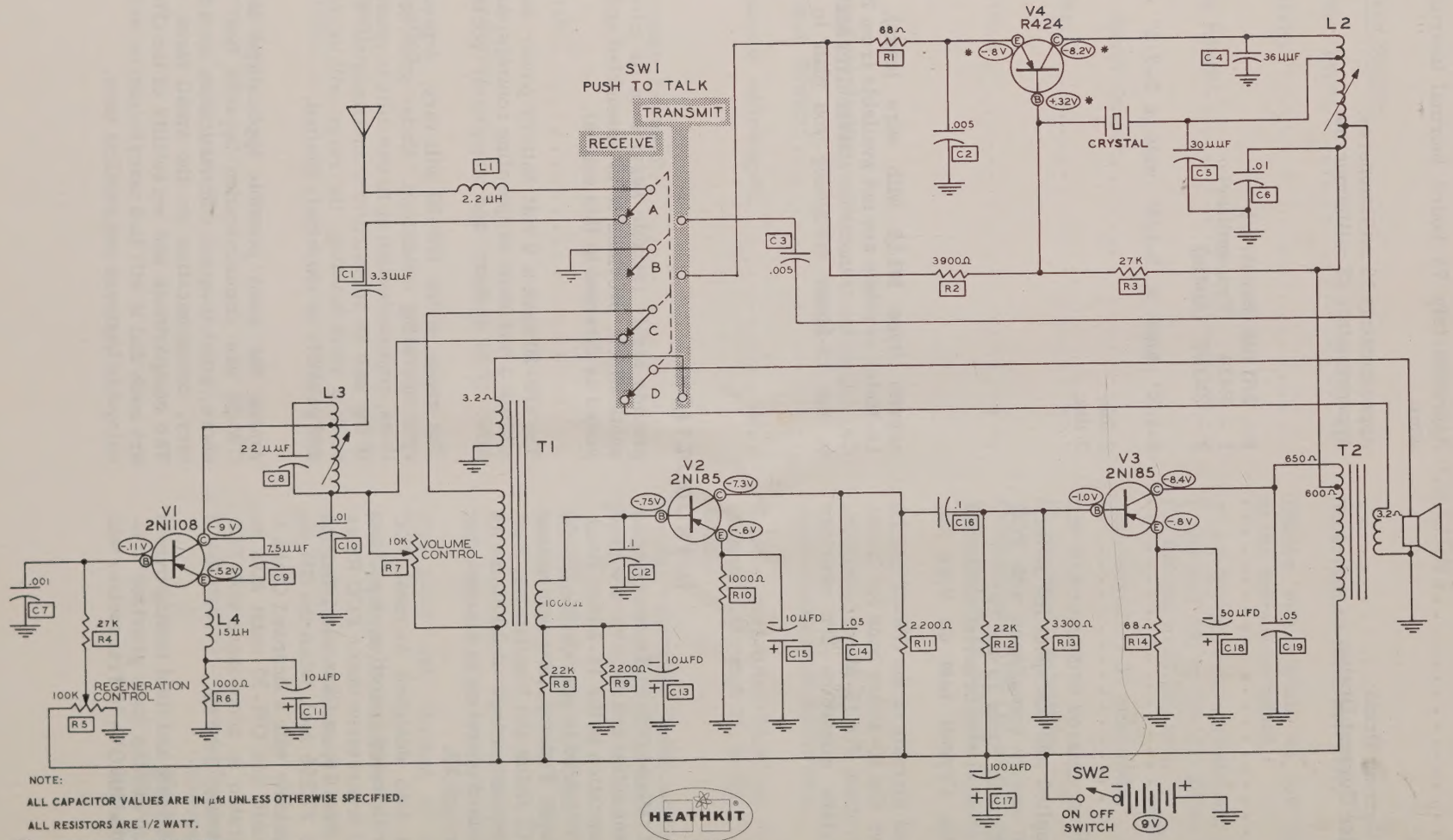
The GW-30 was also designed to meet FCC requirements for licensed operation as a Class D Citizen's Band transceiver under FCC Rules and Regulations, Part 19, on Channels 1 through 23 (26.965 mc to 27.255 mc). When the GW-30 is used to communicate with a licensed Class D Citizen's Band unit, the GW-30 must also be licensed and operated in accordance with FCC Rules and Regulations, Part 19.

Extensive proofbuilding and field testing over a period of several months have provided conclusive evidence that the GW-30 Transceiver will provide highly reliable service in its intended applications, provided it is assembled and adjusted as directed in this manual.

The GW-30 uses a 9 volt battery power supply and has a minimum of operating controls; therefore, it is compact and completely portable.

The range of the GW-30 will vary, depending upon operating conditions. Under good conditions, communication up to one mile is possible. If the unit is operated in a metropolitan area, or in a steel building, the range will decrease and possibly be extremely limited.

Among the many possible applications of the GW-30 are communication between boat and shore, point-to-point communication in a factory, communication on the small farm, etc. The compactness and versatility of the GW-30 are such that it will find many helpful as well as enjoyable business and pastime uses.



NOTE:

ALL CAPACITOR VALUES ARE IN µfd UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS ARE 1/2 WATT.

⬭ INDICATES VOLTAGE READING.

VOLTAGES TAKEN WITH HEATHKIT® VTVM.

VOLTAGES MAY VARY ± 20% DUE TO TOLERANCE OF COMPONENTS.

DC VOLTAGES TAKEN FROM TEST POINT TO CHASSIS GROUND. UNDER NO-SIGNAL CONDITIONS, WITH A NEW BATTERY INSTALLED.

* VOLTAGES TAKEN IN TRANSMIT POSITION.

HEATHKIT®

HAND HELD CITIZENS BAND TRANSCEIVER

MODEL GW-30

CIRCUIT DESCRIPTION

Transmitter

The audio signal from the microphone (speaker) is applied through switch SW1 and transformer T1 to the base of V2, the first 2N185 transistor, for amplification. From V2 the audio signal is applied to V3, the second 2N185 transistor. Operation of V3 causes the voltage in the primary of transformer T2 to vary at an audio rate. This varying voltage is taken from the primary tap of T2 and is used to modulate V4, the R424 transistor used in the transmitter oscillator-output stage. The electrical location of the tap in the primary of T2 is such that modulation is limited to less than 100%.

Coil L2 and capacitor C4 form the transmitter tank circuit. Coil L2 has a low impedance tap to match the antenna and a higher impedance tap to match the crystal. The crystal (.005% accuracy) determines the operating frequency of the transmitter. Capacitor C5 regulates the amount of drive from the crystal that is applied to the base of transistor V4.

Transistor V4 operates as a Class C crystal controlled oscillator and is high-level modulated by the audio signal from transformer T2. Bias voltage for the base of V4 is provided by the voltage divider formed by resistors R2 and R3. These resistors are connected from the modulation voltage supply to ground.

Resistor R1 is in the emitter circuit of V4 and is bypassed by capacitor C2. R1 and C2 are used to stabilize the transmitter circuit.

When transmitting, switch SW1 connects both the emitter circuit of V4 and the voltage divider formed by R2 and R3 to ground.

Modulated RF energy is taken from the low impedance tap of coil L2 and is applied through switch SW1 and through the loading coil L1 to the antenna.

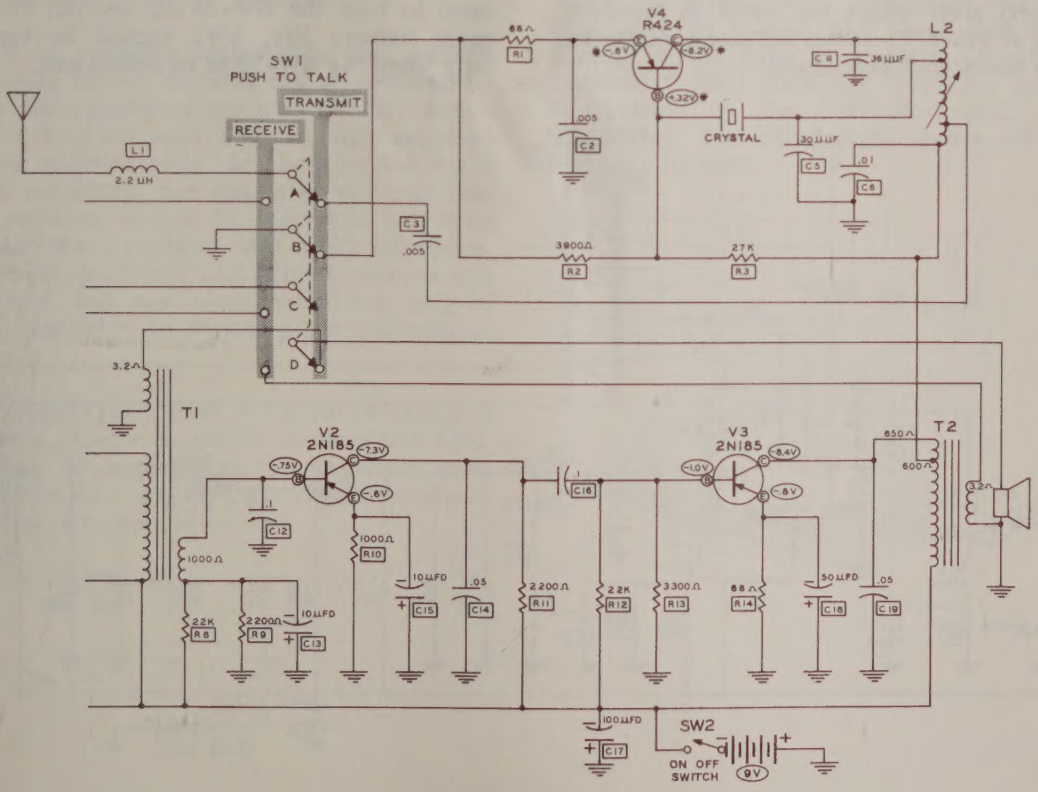


Figure 1

Receiver

The signal received by the antenna is applied through loading coil L1, through switch SW1 and through capacitor C1 to the tap on receiver coil L3. Capacitor C1 minimizes capacitive loading of the receiver by the antenna and reduces radiation from the receiver.

Receiver frequency is set by adjusting L3 which, with C8, forms the receiver tank circuit. C10 is the RF ground for the tank circuit.

Operation of the superregenerative detector is similar to that of an audio amplifier. V1, the 2N1108 transistor stage, is made to oscillate by feeding part of its output signal back into the input. This is done with capacitor C9. With this positive feedback, V1 oscillates at the frequency determined by the tank circuit.

The time constant of the RC circuit (R4, R5 and C7) in the base of V1 is adjustable by R5, the regeneration control. When properly set, this RC circuit lets V1 oscillate to the point of saturation; then V1 stops oscillating for a fraction of a millisecond after which the cycle is repeated. The rate at which V1 starts and stops oscillating is called the quench frequency.

The quench process develops an audio signal that is proportional in frequency and amplitude to the modulation of the received RF signal. V1 serves as an amplifier for this audio signal and applies it to the primary of audio transformer T1. The volume control is connected across the primary of T1 through switch SW1.

This audio signal is applied from the secondary of T1 to the base of V2, the first 2N185 transistor. Capacitors C12 and C14, in the V2 stage, bypass the quench frequency from the audio.

V2 and V3 are conventional audio amplifiers. The output audio signal of V3 is coupled through T2 to the speaker.

Power Supply

Operating power for the GW-30 is provided by a 9 volt battery. Capacitor C17 is used to maintain low impedance voltage supply as the battery discharges. Switch SW2 is physically located on the rear of the volume control and is used to turn the GW-30 off and on. For maximum battery life, SW2 should be turned on only when the GW-30 is in actual use.

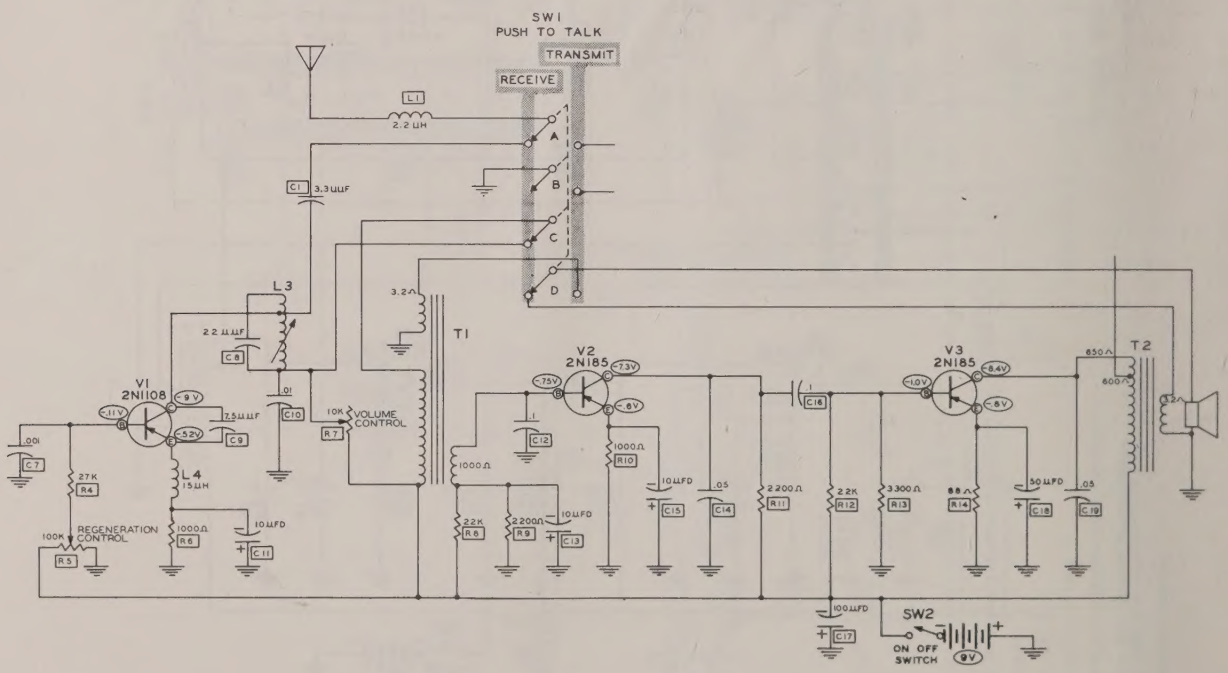


Figure 2

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be a stable instrument, operating at a high degree of dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the charts and other information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the REPLACEMENT section and supply the information called for therein. Include all inspection slips in your letter to us. Hardware items are counted by weight, therefore, there may be a few more or less than the quantity specified. If a few are missing, please obtain them locally if at all possible.

In order to expedite delivery to you, we are occasionally forced to make minor substitution of parts. Such substitutions are carefully checked before they are approved and parts supplied will work satisfactorily. In checking the Parts List for resistors, for example, you may find that a resistor with a 5% tolerance has been substituted for a resistor with a 10% tolerance, as shown in the Parts List. These changes are self-evident and are mentioned here only to prevent confusion in checking the contents of your kit.

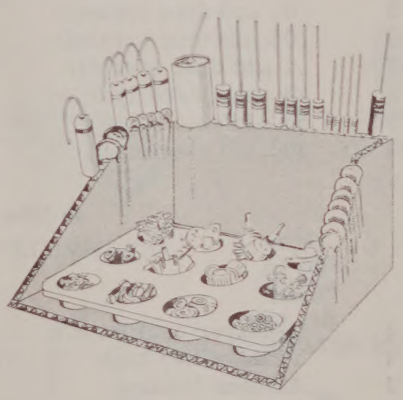
Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -50% are common for electrolytic capacitors.

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.

2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.

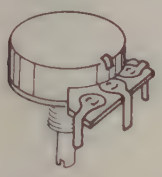


PARTS LIST

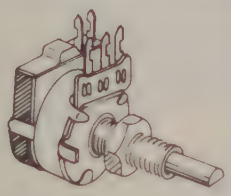
PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
1-2	2	68Ω 1/2 watt (blue-gray-black)
1-9	2	1000 Ω 1/2 watt (brown-black-red)
1-14	1	3300 Ω 1/2 watt (orange-orange-red)
1-22	2	22 KΩ 1/2 watt (red-red-orange)
1-23	2	27 KΩ 1/2 watt (red-violet-orange)
1-44	2	2200 Ω 1/2 watt (red-red-red)
1-46	1	3900 Ω 1/2 watt (orange-white-red)
10-109	1	100 KΩ control (regeneration)
19-54	1	10 KΩ control with switch (volume and OFF-ON)
Capacitors		
20-52	1	7.5 μμf mica
20-96	1	36 μμf mica
20-99	1	22 μμf mica
20-100	1	30 μμf mica
21-14	1	.001 μfd disc ceramic
21-27	2	.005 μfd disc ceramic
21-33	1	3.3 μμf disc ceramic
21-47	2	.01 μfd disc ceramic
21-48	2	.05 μfd disc ceramic
21-81	2	.1 μfd disc ceramic
25-54	3	10 μfd electrolytic
25-55	1	50 μfd electrolytic
25-56	1	100 μfd electrolytic
Coils		
40-317	1	Receiver oscillator
40-318	1	Transmitter tank
40-319	1	Antenna loading
45-51	1	15 μh choke
Transformers		
51-66	1	Audio input
51-67	1	Audio output

PART No.	PARTS Per Kit	DESCRIPTION
Hardware		
250-32	4	6-32 x 3/8" FHMS
250-49	1	3-48 x 1/4" BHMS
250-56	5	6-32 x 1/4" BHMS
250-181	2	6-32 strap screw
251-1	2	#6 spade bolt
252-1	1	3-48 nut
252-3	8	6-32 nut
252-7	1	3/8" nut
252-22	2	6-32 speednut
252-39	4	1/4" nut
253-9	2	#8 flat washer
253-49	1	1/4" flat nylon washer
253-50	1	1/4" nylon shoulder washer
254-1	8	#6 lockwasher
254-7	1	#3 lockwasher
259-12	1	1/4" solder lug
Transistors		
417-6	2	2N185
417-11	1	2N1108
417-33	1	R424
Miscellaneous		
64-10	1	4-section push button switch
85-33F373	1	Circuit board
93-4	1	Simulated leather case and strap
142-35	1	Whip antenna
100-M275	1	Cabinet
203-205	1	Front panel
204-M321	1	Volume control bracket
204-M322	1	Switch bracket
205-M229	1	Cabinet backplate
260-16	2	Alligator clip
330-1	1	Piece of felt
347-1	1	Length 8-conductor cable
390-101	1	Transmitter identification label
390-104	1	Transistor location label
390-105	1	Certification label
401-37	1	Speaker
412-19	1	Lamp
432-33	1	Battery connector
434-103	4	Transistor socket (rectangular)
434-110	1	Transistor socket (round)
455-31	1	1/4" antenna bushing
462-109	1	Knob
490-1	1	Alignment tool
595-345	1	Manual
	1	Crystal
	1	Citizen's Band License Packet

RESISTOR



#10-109
100 K CONTROL

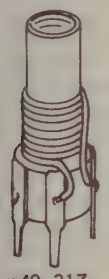


#19-54
10 K CONTROL WITH SWITCH

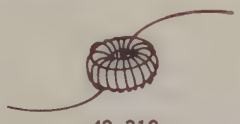
#20-52
7.5 μμf MICA CAPACITOR

#21-27
.005 μfd DISC CAPACITOR

#25-56
100 μfd ELECTROLYTIC CAPACITOR

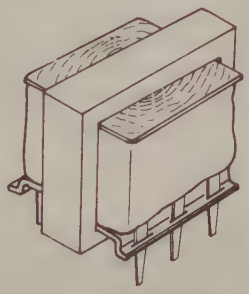


#40-317
RECEIVER OSCILLATOR COIL



#40-319
ANTENNA LOADING COIL

#45-51
15 μh CHOKE



TRANSFORMER

3-48 x 1/4" BHMS

6-32 x 3/8" FHMS

6-32 x 1/4" BHMS

6-32 STRAP SCREW

#6 SPADE BOLT

3-48 NUT

6-32 NUT

6-32 SPEEDNUT

3/8" NUT

1/4" NUT

1/4" FLAT NYLON WASHER

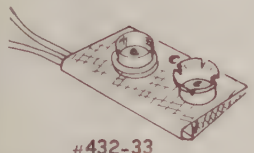
1/4" SHOULDER WASHER

#3 LOCK-WASHER

#6 LOCK-WASHER

#8 FLAT WASHER

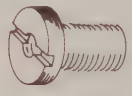
1/4" SOLDER LUG



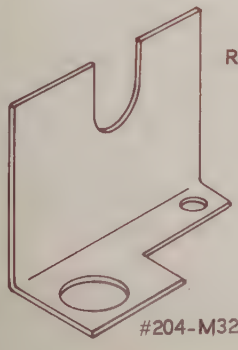
#432-33
BATTERY CONNECTOR

#434-103
TRANSISTOR SOCKET

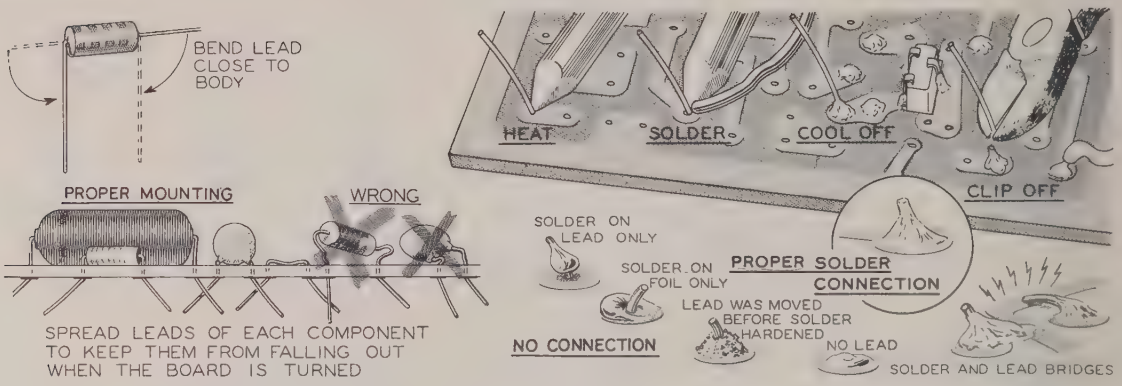
#434-110
ROUND TRANSISTOR SOCKET



#455-31
1/4" ANTENNA BUSHING



#204-M322 SWITCH BRACKET



CIRCUIT BOARD WIRING AND SOLDERING PROCEDURE

Before attempting any work on the circuit board, read the following instructions carefully and study the above figure. It is only necessary to observe a few basic precautions which will insure proper operation of the unit the first time it is turned on.

Proper mounting of components on the board is essential for good performance. A good general rule to follow is that all components on the board should be mounted tightly to the board, unless instructions state otherwise. All leads should be kept short to minimize the effect of stray capacity in the wiring. Proper and improper methods of mounting are illustrated above.

Tubular capacitors and resistors will fit properly if the leads are bent as shown in the accompanying figures. Disc capacitors will generally fit in place with no lead preparation other than determining that the leads are straight. Components with lugs normally require no preparation unless the lugs appear to be bent, in which case they can be straightened with pliers.

Parts should be inserted as instructed, and the leads bent outward slightly, as illustrated, to lock them in place.

Components will be soldered in groups; after a group of components have been installed, instructions will be given to solder them. When the components have been soldered, diagonal cutters may be used to cut off the excess leads close to the solder joint.

The actual technique of soldering leads to a circuit board is quite simple. Position the tip of the soldering iron so that it firmly contacts both the circuit board foil and the wire, or lug, to be soldered, as shown. Then the solder should immediately be placed between the iron and the joint to be soldered. Remove the solder as soon as it begins to melt and flow onto the lead and foil. Hold the tip of the iron in place only until the solder begins to flow outward over the foil; then remove the iron quickly.

Avoid overheating the connection. A soldering pencil or small iron (approximately 30 watts) is ideal for use in circuit board work. If a high wattage iron or soldering gun must be used, precautions must be taken to avoid circuit board damage due to overheating.

The use of an excessive amount of solder will increase the possibility of bridging between foil conductors or plugging holes which are to be left open for wires which may be added later on. If solder is accidentally bridged across insulating areas between conductors, it can be cleaned off by heating the connection carefully and quickly wiping the solder away with a soft cloth. Holes which become plugged can be cleared by heating the area immediately over the hole and gently pushing the lead of a resistor through the hole from the opposite side, and withdrawing the lead before the solder rehardens. Do not force the wire through; too much pressure before the solder has time to soften may separate the foil from the board.

In cases where foil does become damaged, repairs can usually be made with little difficulty. A break in the foil can be rejoined with a small piece of bare wire soldered across the gap, or between the foil and the lead of a component.

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered.

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation on the Schematic, its designation will appear in the construction step which directs its installation.

STEP-BY-STEP ASSEMBLY

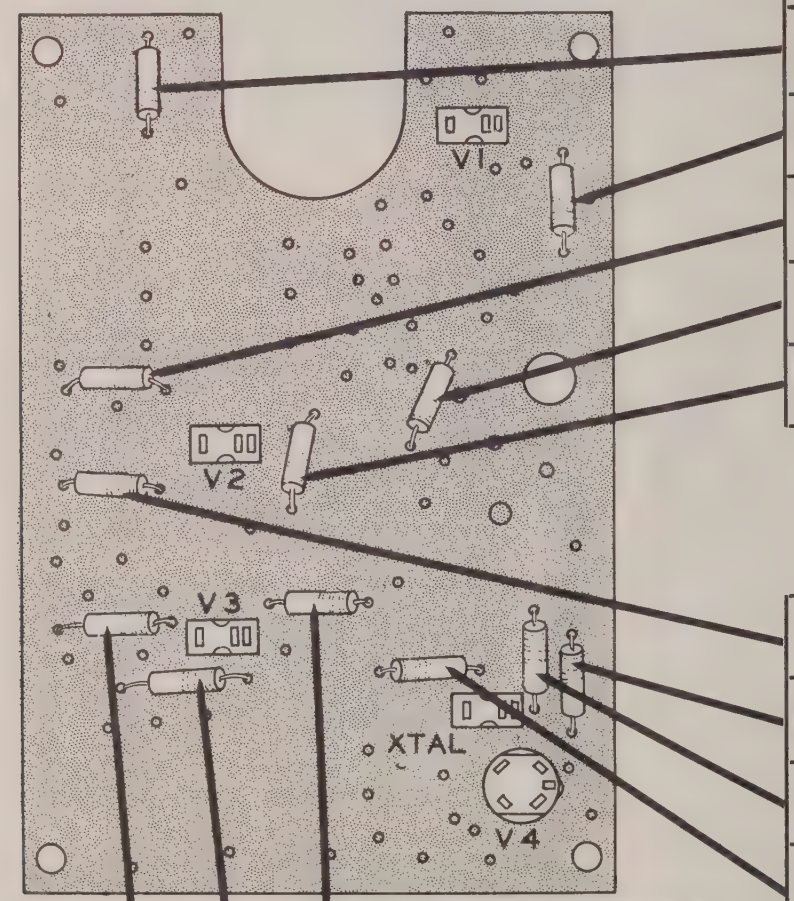
Circuit Board Assembly

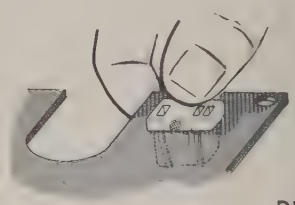
( ) Locate the circuit board and position as shown in Pictorial 1 (screened side up).

Now, complete the steps on Pictorials 1 and 2.

1. ( ) ORIENT AND INSTALL RECTANGULAR TRANSISTOR SOCKETS AT V1, V2, V3, AND XTAL LOCATIONS. SEE DETAIL 1A. SOLDER ALL PINS, SEE PAGE 10.

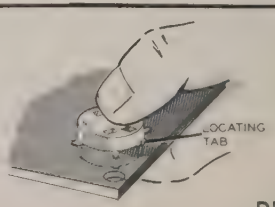
Pictorial 1





DETAIL 1A

2. ( ) R9. 2.2 KΩ RESISTOR (RED-RED-RED).
3. ( ) R4. 27 KΩ RESISTOR (RED-VIOLET-ORANGE).
4. ( ) R11. 2.2 KΩ RESISTOR (RED-RED-RED).
5. ( ) R10. 1 KΩ RESISTOR (BROWN-BLACK-RED).
6. ( ) R8. 22 KΩ RESISTOR (RED-RED-ORANGE).
7. ( ) R6. 1 KΩ RESISTOR (BROWN-BLACK-RED).
8. ( ) R1. 68 Ω RESISTOR (BLUE-GRAY-BLACK)
9. ( ) R2. 3.9 KΩ RESISTOR (ORANGE-WHITE-RED).
10. ( ) R3. 27 KΩ RESISTOR (RED-VIOLET-ORANGE).
11. ( ) V4. ROUND TRANSISTOR SOCKET. SEE DETAIL 1B SOLDER ALL PINS



DETAIL 1B

12. ( ) R12. 22 KΩ RESISTOR (RED-RED-ORANGE).
13. ( ) R14. 68 Ω RESISTOR (BLUE-GRAY-BLACK).
14. ( ) R13. 3.3 KΩ RESISTOR (ORANGE-ORANGE-RED).

NOTE: REVIEW THE SOLDERING INSTRUCTIONS ON PAGE 10 BEFORE GOING TO THE NEXT STEP.

15. ( ) NOW SOLDER ALL CONNECTIONS AND CUT OFF EXCESS LEADS

1. ( ) C17. 100 µfd ELECTROLYTIC CAPACITOR. BE SURE POSITIVE (+) END IS AS SHOWN.

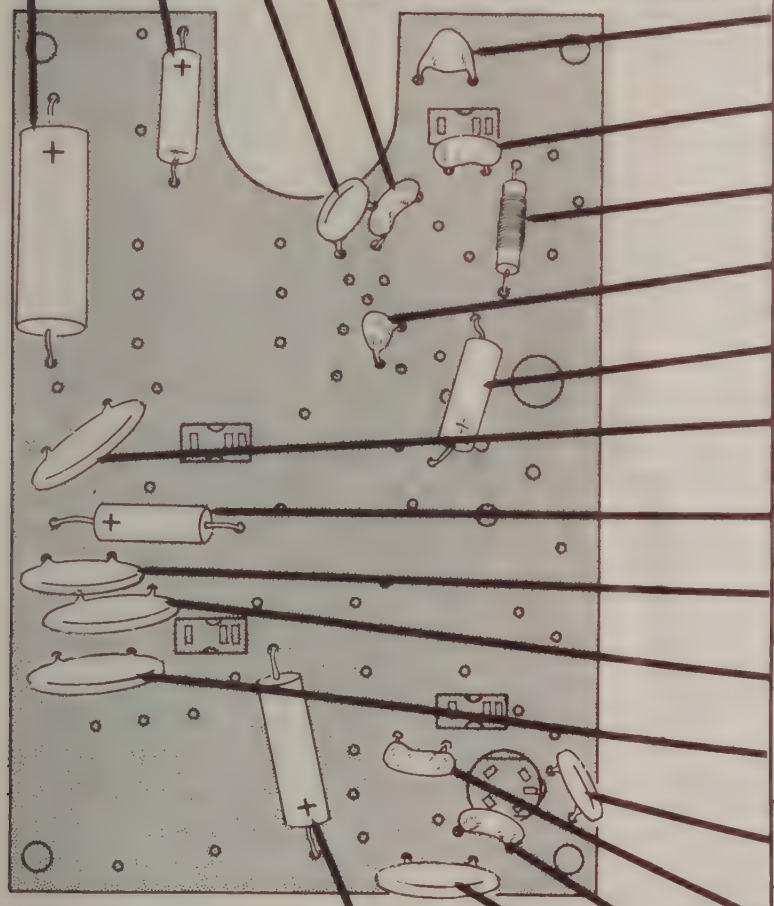
2. ( ) C13. 10 µfd ELECTROLYTIC CAPACITOR

3. ( ) C10. .01 µfd CERAMIC CAPACITOR.

4. ( ) C8. 22 µµf MICA CAPACITOR.

NOTE: WHEN INSTALLING THE ELECTROLYTIC CAPACITOR BE SURE THAT THE POSITIVE (+) END IS PLACED AS SHOWN.

SAVE THE BARE WIRES THAT WILL BE CLIPPED FROM THE CIRCUIT BOARD COMPONENTS. SOME OF THESE WIRES WILL BE USED WHEN "BARE WIRE" IS CALLED FOR IN THE FOLLOWING STEPS.



5. ( ) C7. .001 µfd CERAMIC CAPACITOR.

6. ( ) C9. 7.5 µµf MICA CAPACITOR.

7. ( ) L4. 15 µh RF CHOKE.

8. ( ) C1. 3.3 µµf CERAMIC CAPACITOR.

9. ( ) C11. 10 µfd ELECTROLYTIC CAPACITOR.

10. ( ) C12. .1 µfd CERAMIC CAPACITOR.

11. ( ) C15. 10 µfd ELECTROLYTIC CAPACITOR.

12. ( ) C14. .05 µfd CERAMIC CAPACITOR.

13. ( ) C16. .1 µfd CERAMIC CAPACITOR.

14. ( ) C19. .05 µfd CERAMIC CAPACITOR.

15. ( ) C3. .005 µfd CERAMIC CAPACITOR.

16. ( ) C5. 30 µµf MICA CAPACITOR.

17. ( ) C4. 36 µµf MICA CAPACITOR.

18. ( ) C6. .01 µfd CERAMIC CAPACITOR.

19. ( ) C18. 50 µfd ELECTROLYTIC CAPACITOR.

20. ( ) NOW SOLDER ALL CONNECTIONS AND CUT OFF EXCESS LEADS CLOSE TO THE BOARD.

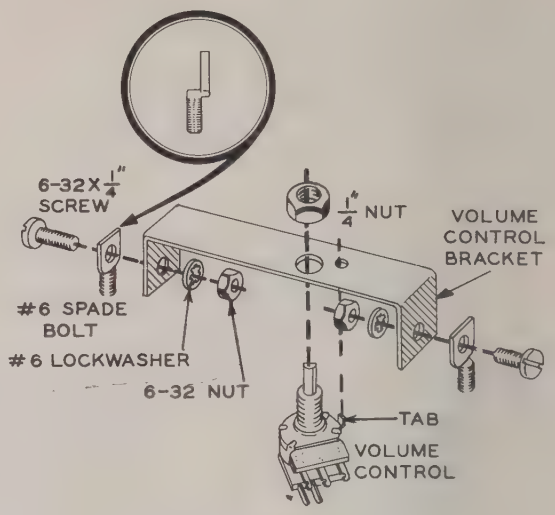
Pictorial 2

See Pictorial 3 for the following steps.

NOTE: The phrase "#6 hardware" means 6-32 x 1/4" BHMS (Binder Head Machine Screws), #6 lockwashers and 6-32 nuts. The other 6-32 screws should be used only when specifically called for.

( ) Locate the volume control bracket and mount a #6 spade bolt at each end. Use #6 hardware.

( ) Mount the volume control on the bracket with a 1/4" nut. Place the locating tab of the control in the small hole next to the mounting hole.



Pictorial 3

See Pictorial 4 for the following steps.

( ) Mount the 100 KΩ regeneration control at location Z on the circuit board. Temporarily secure with a 1/4" nut and solder the three lugs to the circuit board.

( ) Install the volume control bracket on the foil side of the circuit board. Secure with #6 lockwashers and 6-32 nuts. Avoid overtightening as board could be damaged.

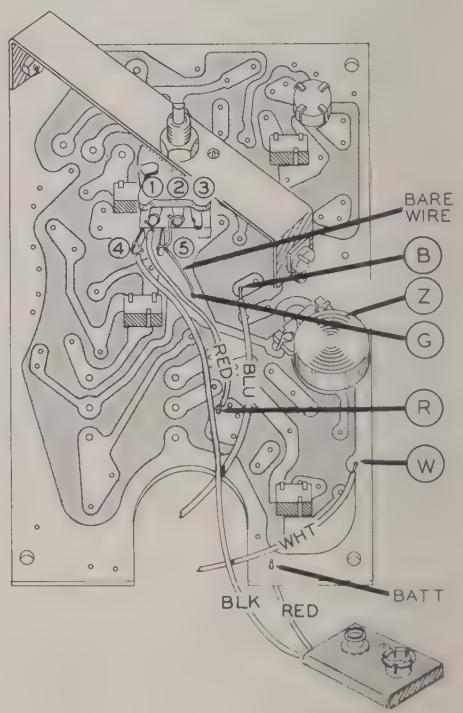
( ) Connect the end of the black wire coming from the battery connector to lug 4 of the volume control (S-1).

( ) Cut the red wire coming from the battery connector to 3" and connect it to the hole marked BATT on the top of the circuit board (S-1).

( ) Cut a 1" length of bare wire. Connect one end to lug 2 of the volume control (S-1). Dress the bare wire against lug 5 of the volume control (NS) and place it in the hole marked G on the circuit board (S-1). Now, solder lug 5 (S-1).

( ) Split the outside cover of the 8-conductor cable with a knife and remove the wires. Be careful not to cut the insulation of the individual wires. These wires will be used as hookup wires in constructing the GW-30. When preparing a length of hookup wire, strip 1/4" of insulation from each end.

( ) Connect one end of a 2" red wire to lug 1 of the volume control (S-1).



Pictorial 4

( ) Connect the other end of this red wire to the hole marked R on the circuit board (S-1).

( ) Connect one end of a 6" blue wire to the hole marked B on the circuit board (S-1). Leave the other end free.

( ) Connect one end of a 6" white wire to the hole marked W on the circuit board (S-1). Leave the other end free.

( ) Now check all circuit board connections made thus far to be sure that they are soldered properly.

Switch Wiring

See Pictorial 5 for the following steps.

( ) Locate the push button switch, SW1, and position it as shown in Pictorial 5.

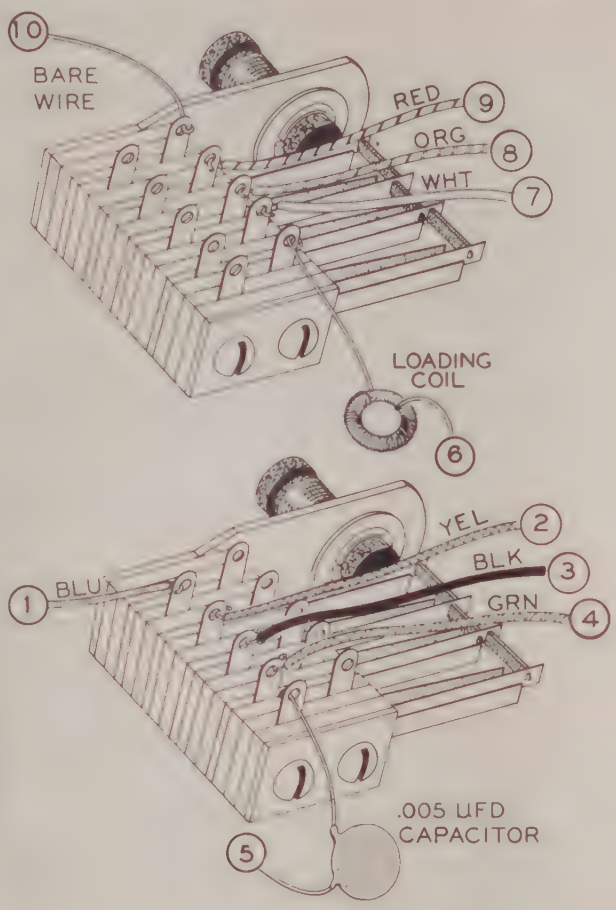
Cut hookup wire to the lengths listed below.

	Wire	Length
( )	Yellow	2-3/4"
( )	Red	2-1/2"
( )	Green	2-1/2"
( )	White	2"
( )	Orange	1-1/2"
( )	Black	1-3/4"
( )	Blue	1-1/4"

( ) Now strip 1/4" of insulation from each end of each of these wires.

Connect one end of each wire to switch SW1 as indicated below and solder each connection.

	Wire	Lug No.
( )	White	7
( )	Orange	8
( )	Red	9
( )	Blue	1
( )	Yellow	2
( )	Black	3
( )	Green	4



Pictorial 5

( ) Cut a 1-1/4" bare wire and connect one end to lug 10 of switch SW1 (S-1). The other end will be connected later.

( ) Cut each lead of a .005 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 5 of switch SW1 (S-1). The other lead will be connected later.

( ) Connect either lead of the loading coil (#40-319) to lug 6 of switch SW1 (S-1). The other lead will be connected later.

SPEAKER PREPARATION

( ) Cut three pieces of felt to the outline shown in Detail 9A.

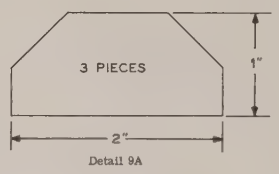
( ) Cut one piece of felt to the outline shown in Detail 9B.

( ) Apply a bead of any all-purpose glue around the edges of each opening on the back of the speaker frame. See Detail 9C.

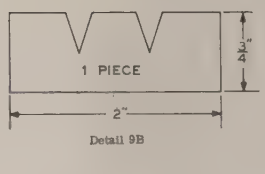
( ) Apply the notched piece of felt to the opening under the speaker terminals. Be careful not to exert excessive pressure on the speaker wires.

( ) Apply the three identical felt pieces to the remaining openings.

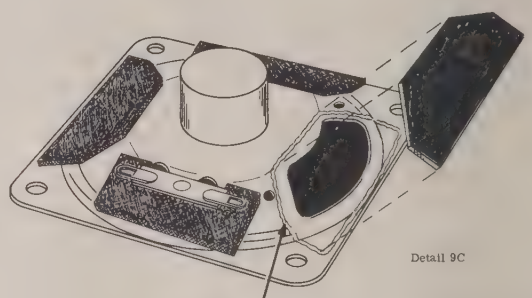
( ) Position the felt pieces so that they are even with the outside edges of the speaker frame: then allow the glue to set before prodeeding with the speaker installation.



Detail 9A



Detail 9B



Detail 9C

SWITCH INSTALLATION

See Pictorial 6 for the following steps.

( ) Position the switch over the circuit board as indicated in Pictorial 6.

Connect the wires coming from the switch to the circuit board as follows:

( ) Red wire to hole R (S-1).

( ) Yellow wire to hole Y (S-1).

( ) White wire to hole W (S-1).

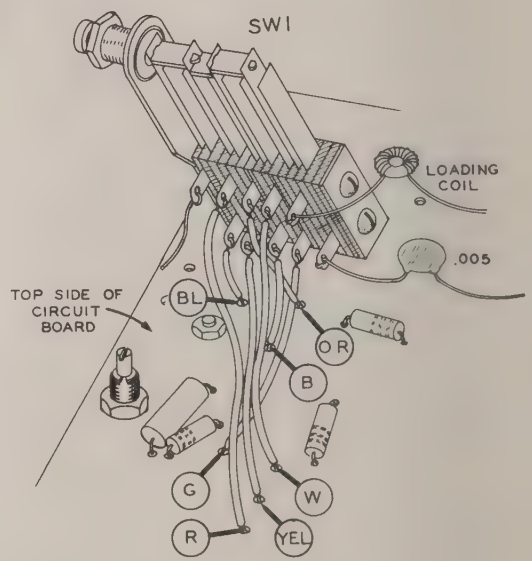
( ) Green wire to hole G (S-1).

( ) Black wire to hole B (S-1).

( ) Bare wire to hole 1 (NS).

( ) Blue wire to hole BL (S-1).

( ) Orange wire to hole OR (S-1).



Pictorial 6

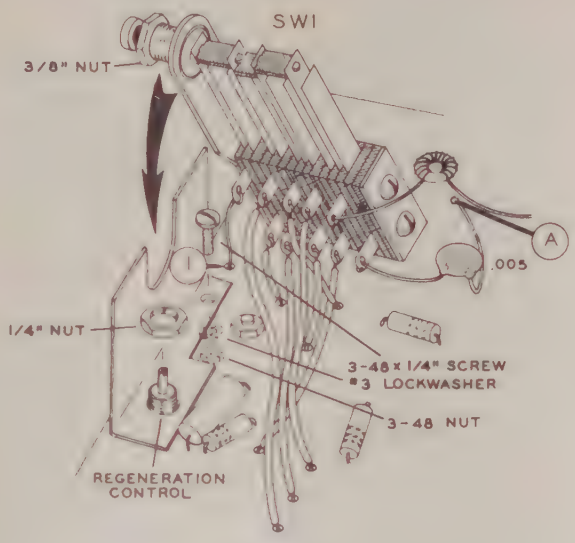
See Pictorial 7 for the following steps.

( ) Remove the 1/4" nut from the regeneration control and mount the switch bracket on the circuit board using the regeneration control nut plus a 3-48 screw, #3 lockwasher and 3-48 nut.

( ) Position the switch in the mounting bracket and secure it with a 3/8" nut. The switch mounting bushing should fit all the way into the bracket slot and the switch body should be parallel to the circuit board.

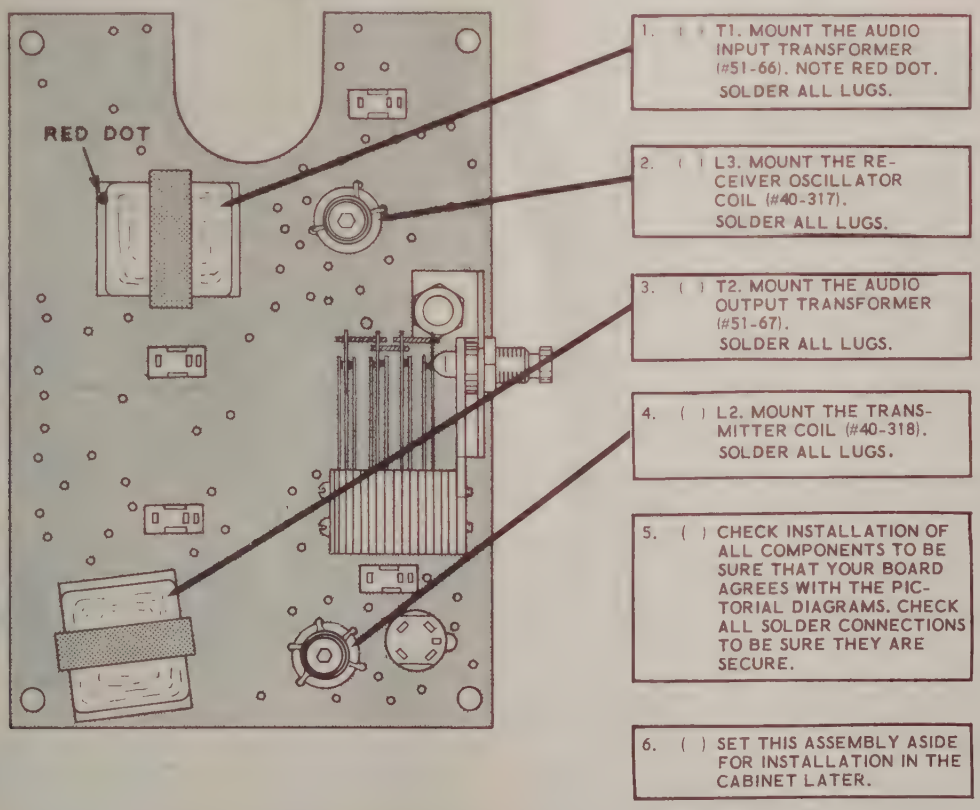
( ) Connect the free lead of the .005 μfd disc ceramic capacitor to the circuit board hole marked A (S-1).

( ) Solder the bare wire at hole 1 of the circuit board. Cut off the excess lead. Make sure that the wires do not touch the switch contact springs.

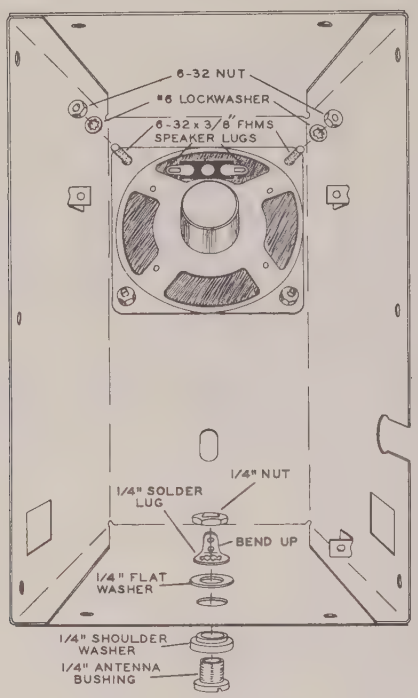


Pictorial 7

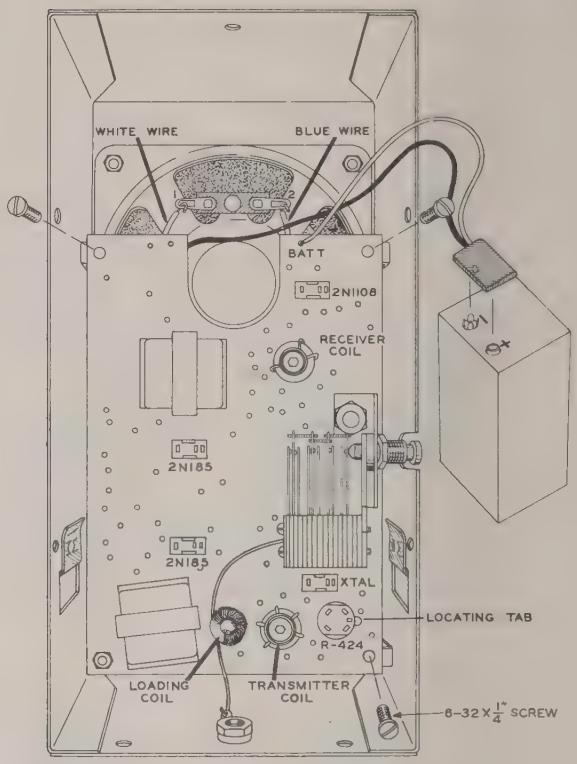
Now, complete the steps on Pictorial 8.


RED DOT
1. ( ) T1. MOUNT THE AUDIO INPUT TRANSFORMER (#51-66). NOTE RED DOT. SOLDER ALL LUGS.
2. ( ) L3. MOUNT THE RECEIVER OSCILLATOR COIL (#40-317). SOLDER ALL LUGS.
3. ( ) T2. MOUNT THE AUDIO OUTPUT TRANSFORMER (#51-67). SOLDER ALL LUGS.
4. ( ) L2. MOUNT THE TRANSMITTER COIL (#40-318). SOLDER ALL LUGS.
5. ( ) CHECK INSTALLATION OF ALL COMPONENTS TO BE SURE THAT YOUR BOARD AGREES WITH THE PICTORIAL DIAGRAMS. CHECK ALL SOLDER CONNECTIONS TO BE SURE THEY ARE SECURE.
6. ( ) SET THIS ASSEMBLY ASIDE FOR INSTALLATION IN THE CABINET LATER.

Pictorial 8



Pictorial 9



Pictorial 10

Cabinet Assembly

See Pictorial 9 for the following steps.

( ) Mount the speaker in the metal cabinet. Use 6-32 x 3/8" FHMS (flat head machine screws), #6 lockwashers, and 6-32 nuts.

( ) Mount the antenna bushing, insulators, and 1/4" solder lug as indicated in Pictorial 9. Place a 1/4" nut on the bushing and tighten securely.

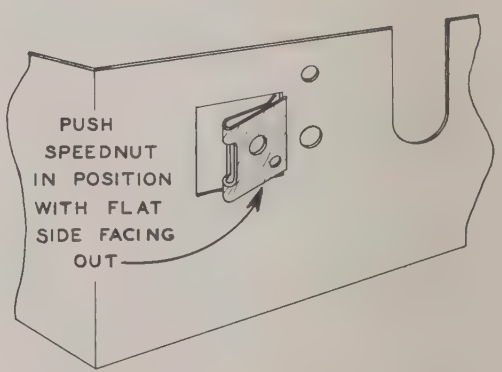
See Pictorial 10 for the following steps.

( ) Connect the free end of the blue wire coming from the circuit board to lug 2 of the speaker (S-1).

( ) Connect the free end of the white wire coming from the circuit board to lug 1 of the speaker (S-1).

( ) Mount the circuit board in the cabinet with 6-32 x 1/4" screws. Dress wires as shown in Pictorial 10.

( ) Place a speednut on each side of the metal cabinet. Make sure the flat side of each speednut is facing outward. See Detail 10A.



Detail 10A

( ) Connect the free lead of the loading coil to the solder lug on the antenna bushing (S-1). Position the coil as shown in Pictorial 10.

( ) Install transistors V1 (2N1108), V2 (2N185), V3 (2N185) and V4 (R424). The locating tab of the R424 transistor should line up with the locating tab on the socket.

( ) Attach the battery connector to the 9 volt battery.

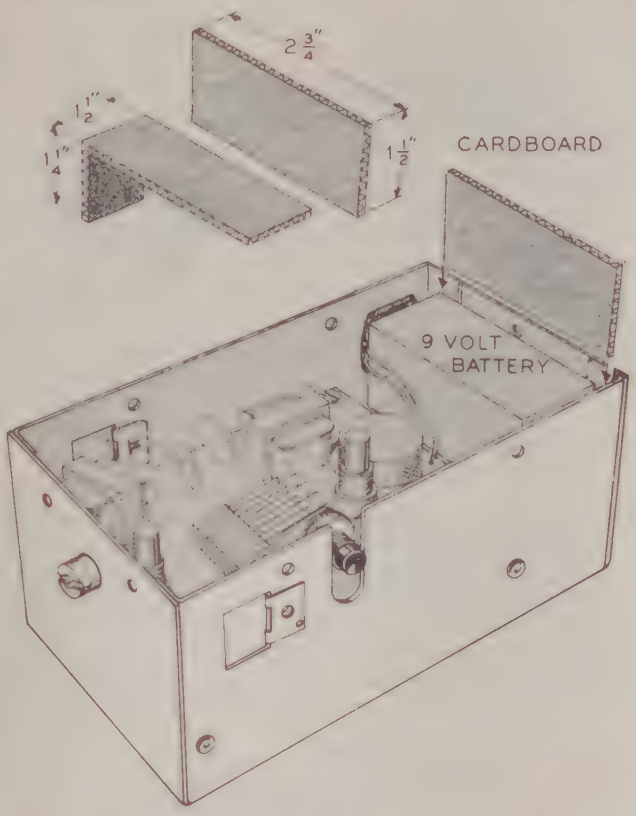
( ) Place the battery in position as shown in Pictorial 11.

( ) Referring to Pictorial 11, cut a piece of cardboard, from the shipping carton of the GW-30, to 1-1/2" x 2-3/4". Cut another piece to 1-1/2" x 4".

( ) Bend a right angle in the longer piece of cardboard at 1-1/4" from one end. Set this piece of cardboard aside for use later.

( ) Place the smaller piece of cardboard between the battery and chassis, as shown.

This completes the chassis wiring and assembly of the GW-30. Complete the Adjustments before proceeding to Final Assembly.



Pictorial 11

ADJUSTMENTS

Regeneration Control

( ) Turn the GW-30 on and advance the volume control fully clockwise. You may or may not hear a "hiss" sound from the speaker.

( ) Set the regeneration control to its maximum counter-clockwise position.

( ) Slowly turn the control clockwise until a hissing sound is heard from the speaker. Now momentarily depress the transmit button on the side of the cabinet.

( ) If the receiver is regenerating (noisy) after releasing the transmit button, leave the regeneration control at its present setting. If there is no hiss noise, slowly turn the control clockwise until hiss is heard after depressing and releasing the transmit button.

Receiver Frequency

1. Preliminary Adjustment:

( ) Locate the transmitter crystal and with your fingers hold it by its case approximately 1/2" from the receiver coil. With the plastic alignment tool, turn the receiver coil slug slowly (a maximum of two turns) in either direction. The slug should be set at the point where there is a minimum amount of hiss. The receiver is now tuned at or very close to the crystal frequency.

( ) Screw the antenna into the antenna bushing and extend it to its longest length.

2. Final Adjustment:

( ) Have someone transmit with the transmitter with which you plan to communicate. This transmitting unit should be far enough away to provide a weak signal. Now, adjust the receiver coil for best reception.

Transmitter

To avoid any conflict with FCC Rules and Regulations in using the GW-30, we recommend that you carefully read the excerpts from FCC Rules and Regulations, Part 15, on Page 27 of this manual.

( ) Construct a dummy load for the transmitter as shown in Figure 3. Use bare wire for the leads.

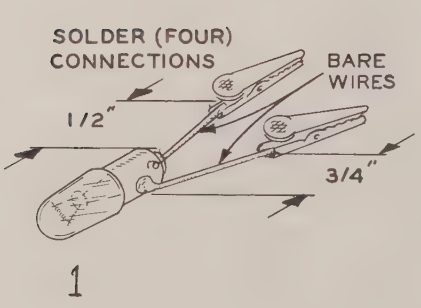


Figure 3

NOTE: The antenna must be removed for the following steps.

( ) Install the crystal in the XTAL socket. Use the outer mounting holes in the socket.

( ) Connect the hot lead of the dummy load (this is the lead coming from the center on the light bulb) to contact A of switch SW1.

( ) Connect the other lead of the dummy load to the switch bracket.

NOTE: Due to the small amount of RF power available, the bulb will glow very dimly. It is therefore suggested that the following adjustment be made in a dimly lighted area, or that the bulb be shaded.

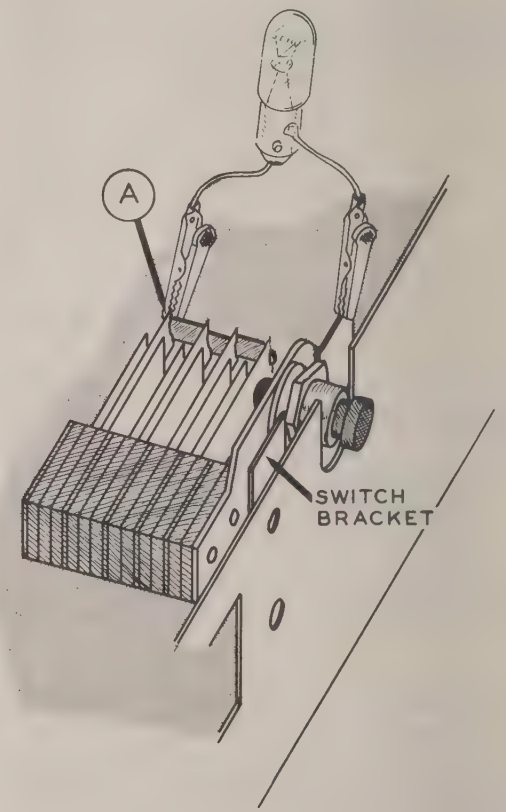


Figure 4

( ) Turn the GW-30 on, depress the transmit button and slowly adjust the transmitter coil slug until the bulb glows at its brightest level.

( ) Now, alternately depress and release the transmit button. If the bulb fails to glow each time the transmitter is turned on, adjust the transmitter coil slug clockwise in steps of one-eighth turn. This should be done only until the lamp glows each time the transmitter is turned on.

This completes the adjustment of the GW-30; however, if a milliammeter is available, the input power to the final RF amplifier may be checked as follows:

( ) Leave the dummy load connected to the transmitter.

( ) Connect the positive (+) lead of the milliammeter to the metal cabinet of the GW-30.

( ) Connect the negative (-) lead of the milliammeter to contact B of switch SW1. See Figure 5.

( ) Place a small piece of paper between the two contacts at B on SW1 as shown in Figure 5. This breaks the emitter circuit of V4 to ground and effectively places the milliammeter in series with the emitter.

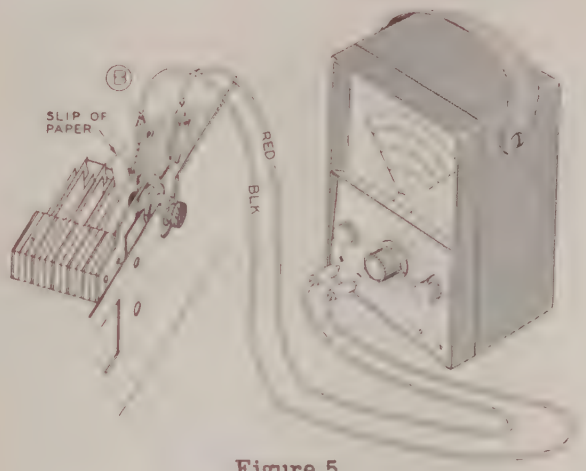


Figure 5

( ) Now, turn the GW-30 on and depress the transmit button. The amount of current being drawn by the final amplifier section will be shown on the meter. This value should not exceed 11 milliamps. The final input power can be computed using ohms law as follows:

P = E x I
P = 9 Volts x 11 milliamps
P = 9 x .011 amps
P = .099 watts
*P = 99 milliwatts

NOTE: FCC Rules and Regulations, Part 15, specify that the input power to the RF amplifier in an unlicensed transmitter must not exceed 100 milliwatts.

*NOTE: Normal current should be between 8 and 11 milliamps. If current is appreciably different, see IN CASE OF DIFFICULTY section on Page 24.

FINAL ASSEMBLY

( ) Remove the backing paper from the transistor location label (#390-104) and place the label on the inside of the cabinet backplate.

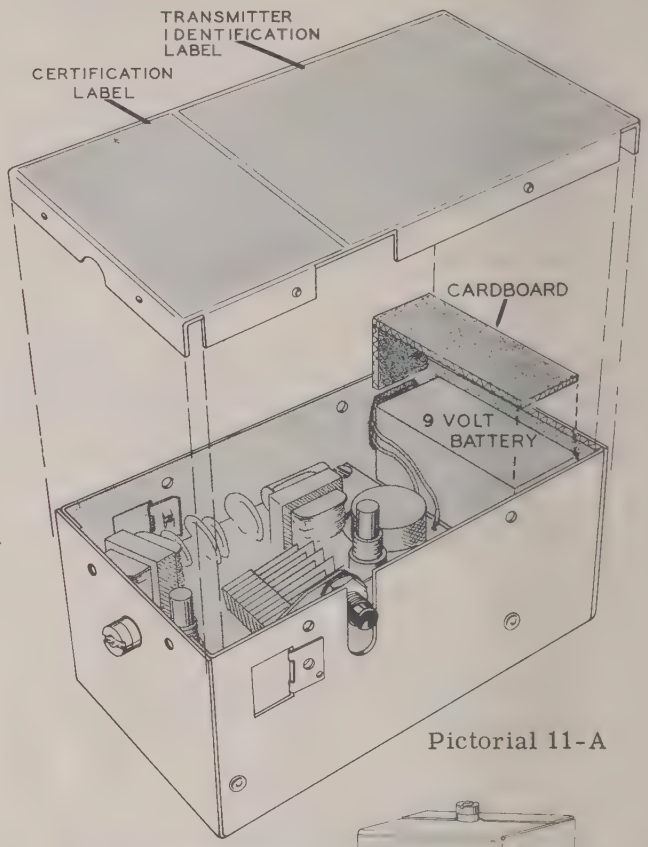
See Pictorial 11-A for the following steps.

( ) Remove the backing paper from the certification label (#390-105) and place the label on the outside of the cabinet backplate. Now read and sign the label.

( ) If this GW-30 is to be used in the Class D (licensed) Citizen's Band Service, also place the transmitter ID label (#390-101) on the outside of the cabinet backplate. Appropriately fill in the ID label.

( ) Place the remaining piece of cardboard over the battery as shown in Pictorial 11-A

( ) Now snap the backplate in place.

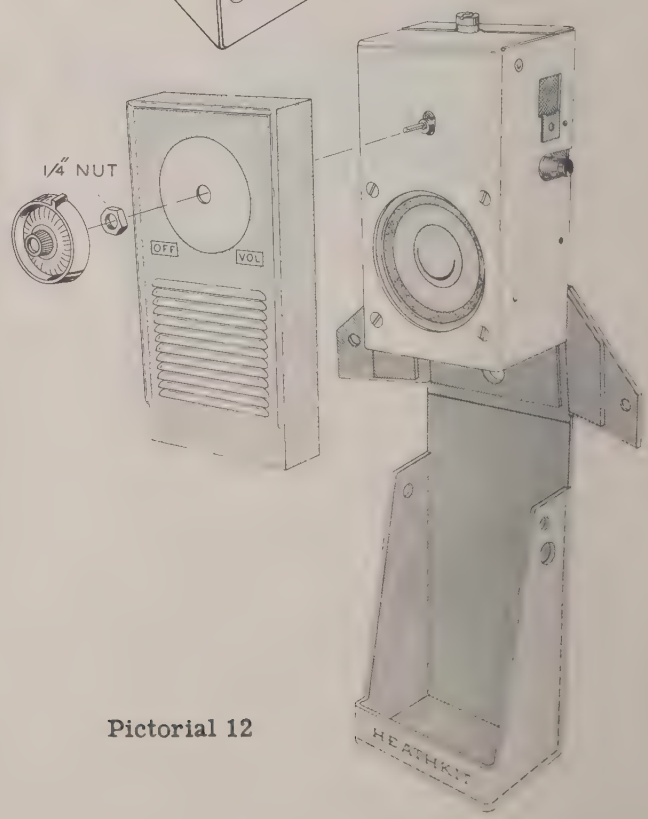


Pictorial 11-A

See Pictorial 12 for the following steps.

( ) Place the front panel over the face of the metal cabinet. Position the front panel so that the volume control shaft extends through it.

( ) Secure the front panel with a 1/4" nut on the volume control.



Pictorial 12

See Pictorial 13 for the following steps.

( ) Slide the metal cabinet-front panel assembly into the leather case from the top.

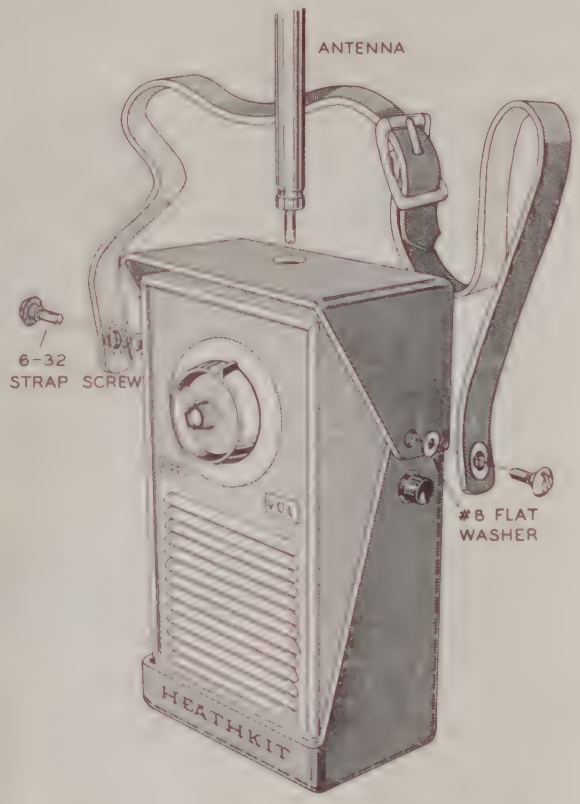
( ) Fold the top of the leather case down so that the holes in the flaps line up with the speednuts on the sides of the metal cabinet.

( ) Place a 6-32 strap screw through each hole in the carrying strap and through a #8 flat washer. Fasten the strap to the metal cabinet using the speednuts.

( ) Install the antenna in the antenna bushing.

( ) Install the volume control knob. The flat surface of the shaft corresponds to the flat surface on the inside of the knob.

This completes the assembly of your GW-30 Hand-Held Citizen's Band Transceiver.



Pictorial 13

OPERATION

Turn the GW-30 on with OFF-ON volume control. Advance the volume control until a loud hiss is heard at a normal listening level. You are now ready to put the GW-30 into operation.

To operate the transmitter portion of the GW-30, it should be held in the palm of the hand with the front panel touching your cheek as shown in the illustration. By touching the front panel to your cheek, you, in effect, form a ground plane for the antenna and thereby, increase transmitting efficiency as well as receiving signal strength. Now, depress the transmit push button and talk at a normal level into the front panel louvers. NOTE: Shouting into the unit will cause overloading of the modulator, resulting in distortion. To listen, simply release the transmit button.

*NOTE: If the GW-30 is to be used as a Class D Citizen's Band station, the complete Part 19 included in the license packet must be read.

PUSH BUTTON ALL THE WAY IN TO TALK

IN CASE OF DIFFICULTY

UNIT FAILS TO OPERATE

1. Recheck the wiring. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits returned for repair, malfunction due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections as illustrated in the figure found in the CIRCUIT BOARD WIRING AND SOLDERING section of this manual.

3. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those found on the Schematic Diagram. NOTE: All voltage readings were taken with a HEATHKIT® Vacuum Tube Voltmeter. Voltages may vary 10% due to component tolerances.

6. Check transistors with a transistor tester or by substitution of transistors of the same types, known to be good.

7. A review of the CIRCUIT DESCRIPTION and SCHEMATIC DIAGRAM will prove helpful in indicating where to look for trouble.

CONDITION	POSSIBLE CAUSE
Low and Distorted Output	The battery voltage should be checked under load (with the unit turned ON). The battery voltage should be between 9 and 6 volts. Interchange the 2N185 transistors.
Receiver Fails to Operate Under Extreme Temperature Changes	Check the setting of the regeneration control.
Weak Receiver Volume, No Modulation	Check installation of transformer T1 (#51-66).
Normal Receiver Hiss, No Signal	The fiber spacers on the switch may be moved out of position. Receiver coil L3 adjustment.
Squeal or Heterodyne in Receiver	Proximity with another receiver. Beat between receiver oscillator and transmitter crystal. Readjust the receiver coil.
Light Bulb Fails to Glow	Battery voltage low. Solder connections around V1, SW1, and crystal socket.
Transmitter Current Too Low	Battery voltage low. R1 or R3 high in value. R2 low in value. Transistor V4 defective. Adjustment of coil L2.
Transmitter Current Too High	Short circuit on board or SW1. Resistors R1 or R3 low in value. R2 high in value. Light bulb disconnected. Transistor V4 defective.

SERVICE INFORMATION

SERVICE

If, after applying the information contained in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT® equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT® equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under "IN CASE OF DIFFICULTY." Possibly it will not be necessary to write.

2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units and anything else that might help to isolate the cause of trouble.

3. Report fully on the results obtained when testing the unit initially and when following the suggestions under "IN CASE OF DIFFICULTY." Be as specific as possible and include voltage readings if test equipment is available.

4. Identify the kit model number and date of purchase, if available.

5. Print or type your name and address, preferably in two places on the letter.

With this information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. He will make no incorrect assumptions nor waste time checking files for the correct spelling of name and address. (The automatic letter opener sometimes cuts through the letter, hence the suggestion to print the name and address twice.) In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed instrument (including all connecting cables) to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a fixed fee of $5.00, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT® Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT® equipment. Although you may find charges for local service somewhat higher than those listed in HEATHKIT® manuals (for factory service), the amount of increase is usually offset by the transportation charge you would pay if you elected to return your kit to the Heath Company.

HEATHKIT® Service Centers will honor the regular 90 day HEATHKIT® Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT® equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT® dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT® equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT® products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the type and model number of kit in which it is used.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that your instrument must be returned for service, these instructions should be carefully followed.

ATTACH A TAG TO THE EQUIPMENT BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Be sure to include the crystal and all transistors. It is not necessary to return the antenna. Clearly print the address on the carton as follows: HEATH COMPANY
Benton Harbor, Michigan

Include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

EXCERPTS FROM FCC RULES AND REGULATIONS PART 15

Sec. 15.3 General condition of operation. Persons operating restricted or incidental radiation devices shall not be deemed to have any vested or recognizable right to the continued use of any given frequency, by virtue of prior registration or certification of equipment. Operation of these devices is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by other incidental or restricted radiation devices, industrial, scientific or medical equipment, or from any authorized radio service.

Sec. 15.4 (f) Low power communication device. A low power communication device is a restricted radiation device, exclusive of those employing conducted or guided radio frequency techniques, used for the transmission of signs, signals (including control signals), writing, images and sounds or intelligence of any nature by radiation of electromagnetic energy.

Examples: Wireless microphone, phonograph oscillator, radio controlled garage door opener and radio controlled models.

Sec. 15.201 Frequencies of operation.
(a) A low power communication device may be operated on any frequency in the bands 10-490 kc, 510-1600 kc and 26.97-27.27 mc.

Sec. 15.205 Operation within the frequency band 26.97-27.27 mc. A low power communication device may operate within the band 26.97-27.27 mc (27.12 mc ±150 kc) provided it complies with all of the following requirements:

(a) The carrier of the device shall be maintained within the band 26.97-27.27 mc.

(b) All emissions, including modulation products, below 26.97 mc or above 27.27 mc shall be suppressed 20 db or more below the unmodulated carrier.

(c) The power input to the final radio stage (exclusive of filament or heater power) shall not exceed 100 milliwatts.

(d) The antenna shall consist of a single element that does not exceed 5 feet in length.

Sec. 15.208 Certification requirements.
(a) No low power communication device manufactured after January 1, 1958 shall be operated without a station license unless it has been certificated to demonstrate compliance with the requirements in this part.

(b) The owner or operator need not certificate his own low power communication device if it has been certificated by the manufacturer or distributor.

(c) Where certification is based on measurement of a prototype, a sufficient number of units shall be tested to assure that all production units comply with the technical requirements of this subpart.

(d) The certificate may be executed by a technician skilled in making and interpreting the measurements that are required to assure compliance with the requirements of this part.

(e) The certificate shall contain the following information:

(1) The operating conditions under which the device is intended to be used.

(2) The antenna to be used with the device.

(3) A statement certifying that the device can be expected to comply with the requirements of this subpart under the operating conditions specified in the certificate.

(4) The month and year in which the device was manufactured.

Sec. 15.209 Location of certificate. The certificate shall be permanently attached to the device and shall be readily visible for inspection.

Sec. 15.210 Interference from low power communication devices. Notwithstanding the other requirements of this part, the operator of a low power communication device, regardless of date of manufacture, which causes harmful interference to an authorized radio service, shall promptly stop operating the device until the harmful interference has been eliminated.

Reprinted by Heath Company from FCC Rules and Regulations, Part 15.

CRYSTAL LIST

CHANNEL	PART NO.	FREQUENCY, MC
1	404-67	26.965
2	404-68	26.975
3	404-69	26.985
4	404-70	27.005
5	404-71	27.015
6	404-72	27.025
7	404-73	27.035
8	404-74	27.055
9	404-75	27.065
10	404-76	27.075
11	404-77	27.085
12	404-78	27.105
13	404-79	27.115
14	404-80	27.125
15	404-81	27.135
16	404-82	27.155
17	404-83	27.165
18	404-84	27.175
19	404-85	27.185
20	404-86	27.205
21	404-87	27.215
22	404-88	27.225
23	404-89	27.255

WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

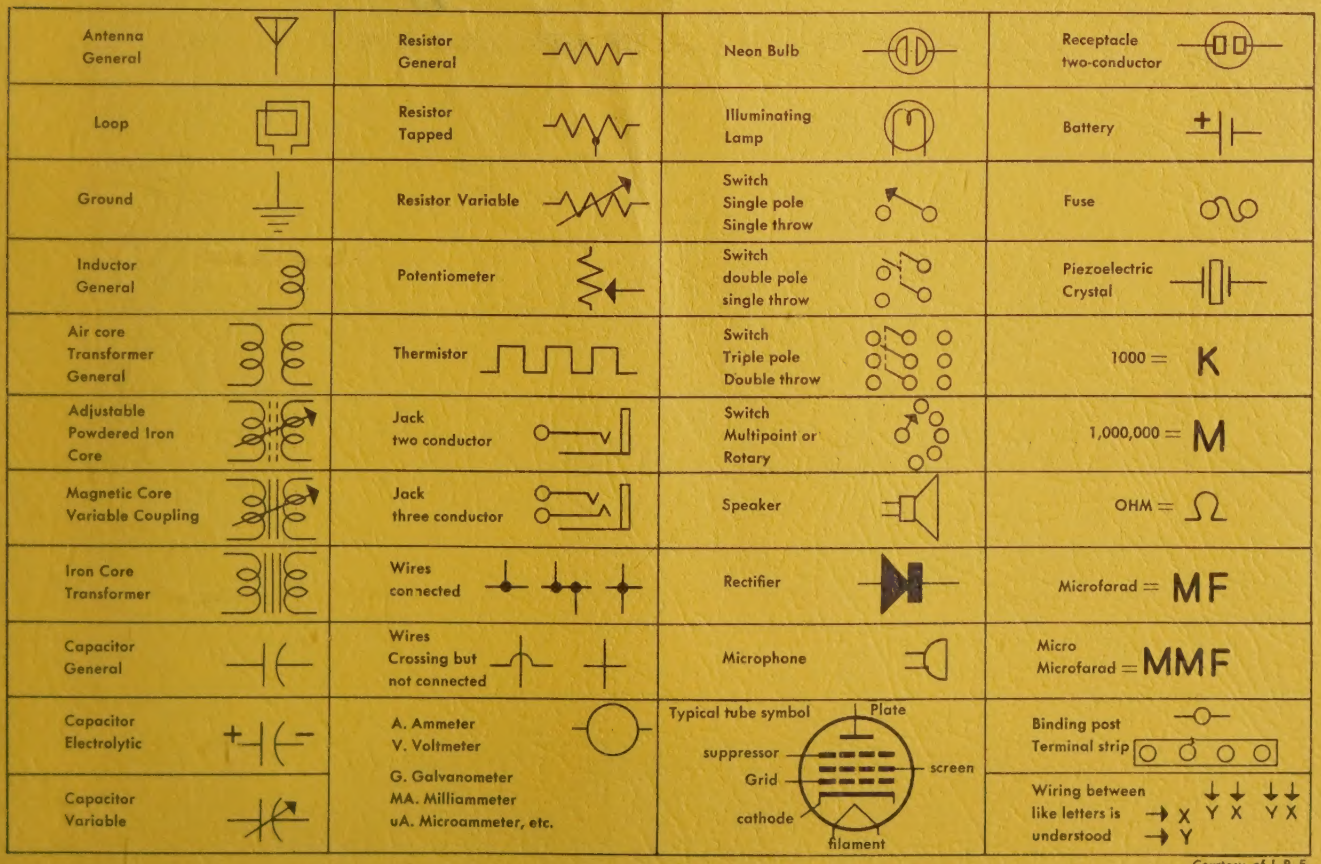
When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.



Courtesy of I. R. E.

HEATH COMPANY

BENTON HARBOR, MICHIGAN

a subsidiary of

DAYSTROM, INCORPORATED

MP MASTER
MA22766

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

595-345

LITHO IN U. S